ENERGY INFORMATION PAPER

TRANSPORTATION ENERGY TRENDS

ENERGY TRENDS IN ONTARIO
A FIVE PART SERIES

INTRODUCTION

This paper is one of a five-part series that analyzes the recent historical trends in Ontario's energy consumption, and complements the forecast for provincial energy demand contained in **Energy 2000 – The Shape of Ontario's Energy Demand.**

This paper details the trends that have emerged in transportation in Ontario. The other papers in the series highlight trends in industrial, residential, commercial and institutional buildings, and total energy use for the province.

TRANSPORTATION ENERGY TRENDS

The amount of energy consumed in Ontario for transportation purposes peaked in 1979, after steadily increasing for many years. In that year, nearly 18 billion litres of gasoline, diesel and other fuels were used to power our automobiles, trucks, ships, airplanes, trains, subways and buses.

Between 1979 and 1982, fuel use declined sharply, reaching a low of 16 billion litres in 1982, largely due to the effects of the severe economic recession. Since 1982, there has been a slight increase to about 16.4 billion litres in 1985. But the trend of increasing fuel demand appears to have changed permanently, to a much lower rate of growth compared to the pre-1979 period.

In Ontario, gasoline remains the predominant transportation fuel. However, its share of total fuel requirements has declined from 80 per cent in 1972, to about 71 per cent in 1985. Diesel's share of total use doubled over the last 12 years to 17 per cent — due to increased freight transport by truck, and increasing numbers of diesel-powered cars. Other fuels, primarily aviation turbo jet fuel, increased from 10 to 12 per cent of total transportation fuel demand.

On a per capita basis, Ontario's transportation energy use increased by less than 4 per cent in the 1972-82 period. This increase compares very favorably with West Germany and the United Kingdom, where per capita transportation energy use increased by 21 and 13 per cent respectively over the same period.

However, Ontario's level of per capita consumption was more than double that of West Germany and the United Kingdom. In 1982, Ontarians used the equivalent of 1,800 litres of gasoline per person. West Germans used 830 litres, and the British just 760 litres.

This much greater level of consumption can be at least partially explained by the physical characteristics of Ontario. Goods and people must travel greater distances to reach major population centers in Ontario than in Europe. In addition, Ontario relies more on the least fuel-efficient means of transport — road travel by car and truck — than the more densely-populated countries of Europe.

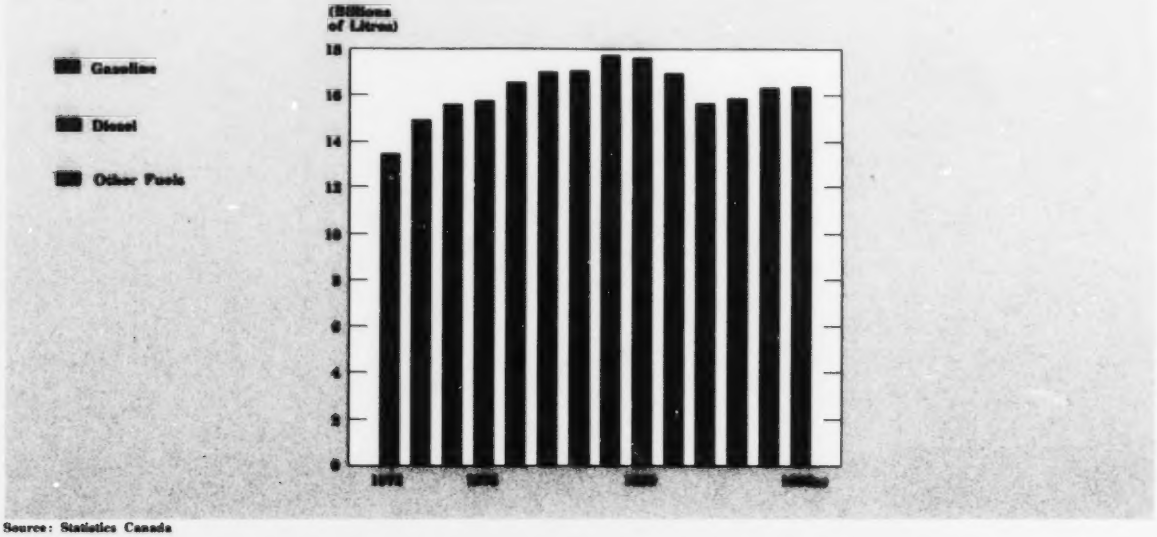
Why Have These Trends Emerged?

Energy in transportation is used for moving people (60 per cent) and for moving goods (40 per cent). The automobile is the major passenger vehicle, while trucks and trains move most of the freight.

There are two major influences on the amount of fuel used in transportation. These are the number of people and the volume of goods moved, and the cost of transportation, which is directly linked to the cost of fuel.

The number of people and the amount of freight transported in any given period is closely related to the rate of economic growth. When the economy is

TRANSPORTATION FUEL USE



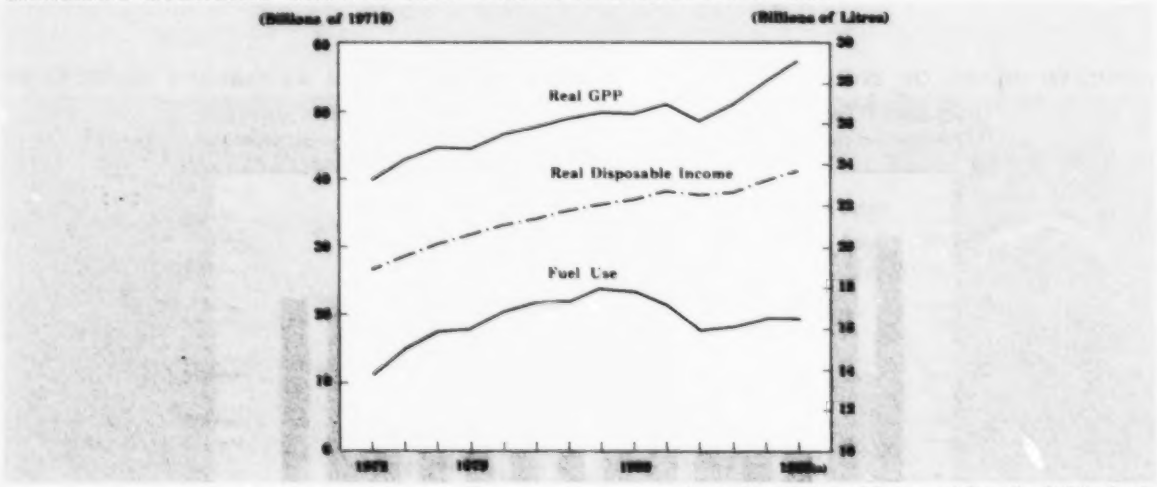
Source: Statistics Canada

expanding, as Ontario's economy did in the early 1970s, there is an increase in the movement of raw materials to factories and processing plants. In turn, the increased output of the manufacturing plants needs to be moved to wholesale and retail markets. As well, an expanding economy generates employment and higher incomes that are spent on transportation in several forms, such as more automobile purchases and airline travel.

However, when the economy contracts, or expands less rapidly, there is a corresponding impact on transportation. Freight and passenger transportation requirements decline. As a consequence, fuel demand grows less rapidly, or may even decline.

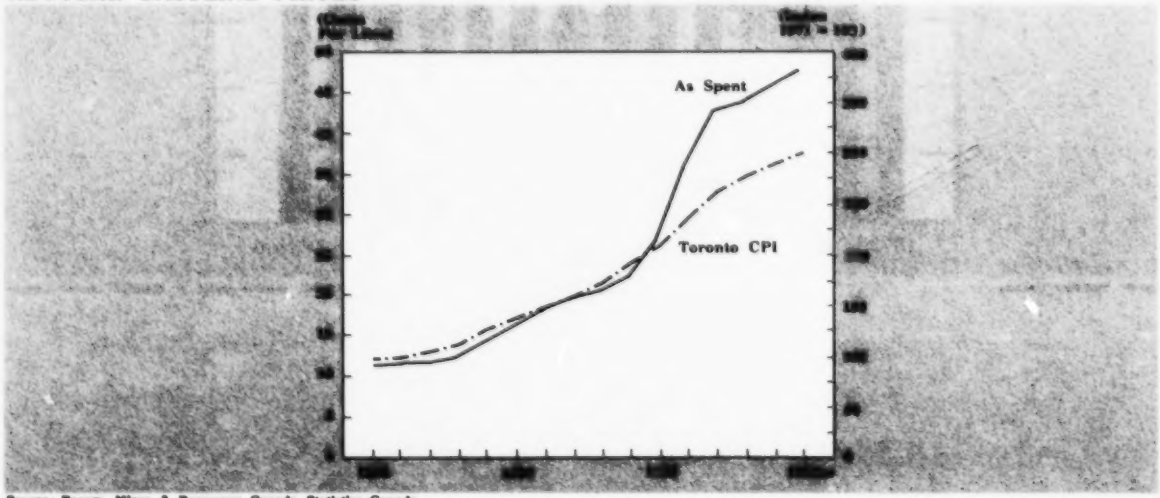
The second major influence on transportation fuel demand is the cost of transportation. Fuel costs are the most visible and important component of total costs for most methods of travel and transport. Since gasoline is the predominant fuel, the price of gasoline is the most indicative transportation fuel cost. The following chart shows the average retail price of gasoline in Ontario and the Toronto Consumer Price Index (CPI) for the 1970-85 period.

ONTARIO'S ECONOMIC GROWTH AND TRANSPORTATION FUEL USE



Source: Ontario Ministry of Treasury and Economics, Statistics Canada

REGULAR GASOLINE PRICES



Source: Energy, Mines & Resources Canada, Statistics Canada

The price of gasoline in Ontario increased steadily from 1972 to 1985. In fact, the 1985 price was more than 300 per cent higher than the price in 1972. However, the "real" price, or, the price after adjusting for inflation, did not progress smoothly upward. It declined in the 1978-79 period, when inflation outpaced gasoline price increases, and then escalated significantly in the early 1980s. By 1985, the "real" price was 42 per cent greater than the 1972 level, with most of this increase occurring during the 1979-85 period.

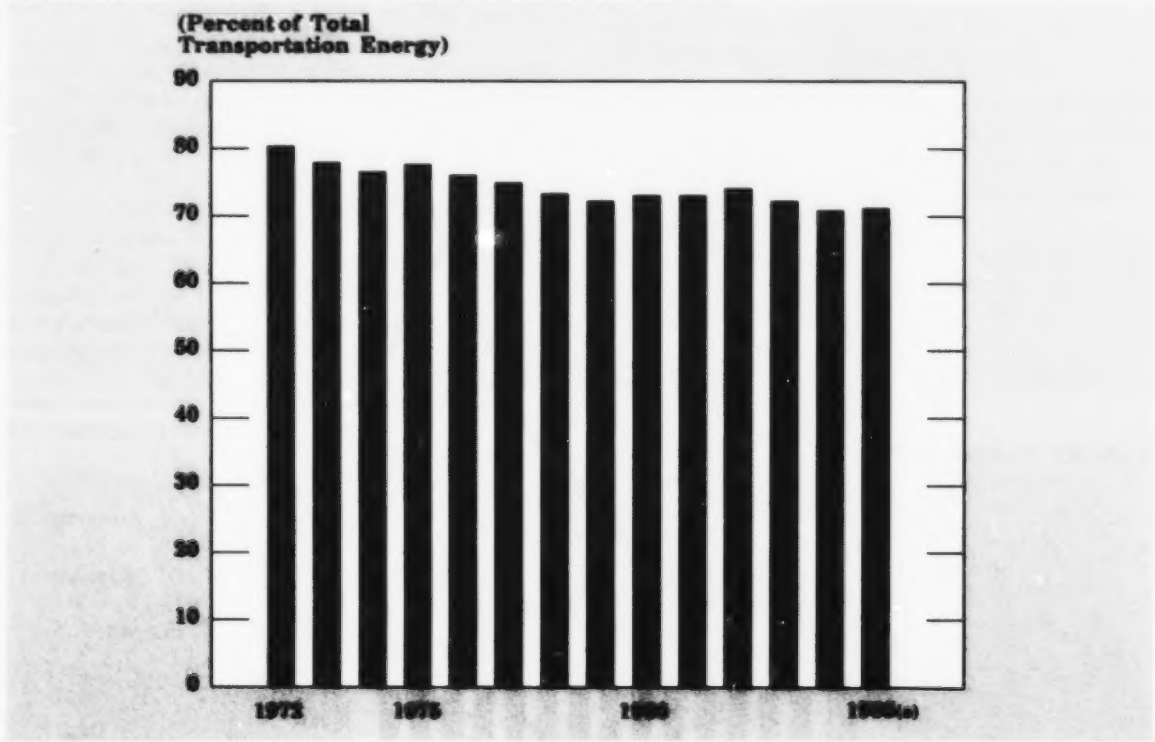
In terms of dollars spent for fuel, a motorist who drove 16,000 kilometres in 1985 paid about $985 for gasoline. In 1972, the same motorist, using the same car, would have paid about $250 to travel the same distance.

As the "real" price of gasoline increased significantly in the late 1970s and early 1980s, the trend toward using more transportation fuel was reversed. The combination of lower rates of economic growth and increased fuel costs caused consumers to modify their behaviour and reverse a long-term trend in transportation energy consumption.

Gasoline Use

The share of total transportation fuel needs supplied by gasoline has declined steadily since 1972. But, the total amount of gasoline used in Ontario has decreased only since 1980. These declines occurred while automobile ownership expanded from 36 cars per hundred people in 1972 to about 45 in 1985. Moreover, the total number of

GASOLINE SHARE OF TOTAL TRANSPORTATION FUEL USE



Source: Statistics Canada

automobiles on the road increased by over one million during the same period. In 1985, there were close to four million registered passenger cars in Ontario.

This erosion of gasoline's market share and the decrease in volumes used is largely explained by a change in consumer preferences for new car purchases. In the late 1970s, consumers began to choose lighter, smaller and more fuel-efficient new cars, to replace the "gas guzzling" models of the 1960s and early 1970s.

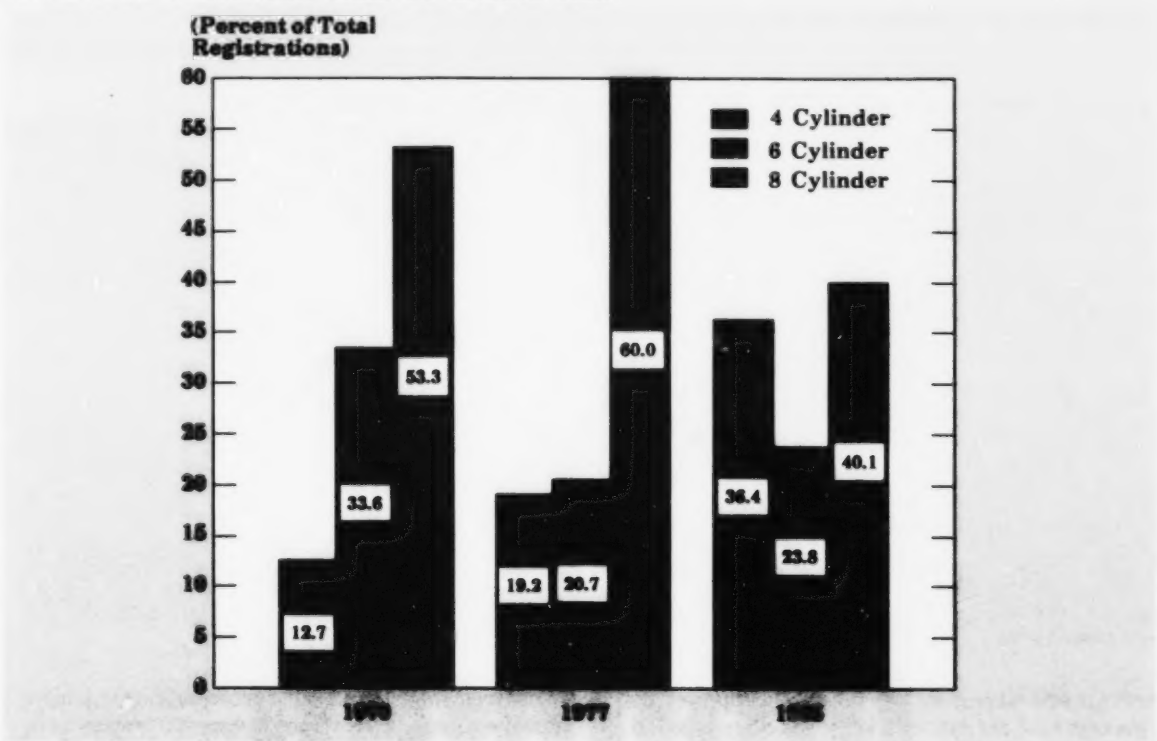
Since 1977, the proportion of automobiles with eight cylinders on Ontario's roads has declined sharply. At the same time, the number and proportion of four-cylinder registrations has increased.

The average new car purchased in 1985 was 300 kilograms (660 pounds) lighter, had an engine that was 35 per cent smaller, and a fuel economy rating that was 25 per cent better, than the average new car in 1978.

Some examples of the improvement in fuel efficiency are listed in the following chart. Both domestic and imported cars showed a very significant improvement in fuel economy over the 1979-85 period. Increased fuel economy was evident in all types and sizes of vehicles.

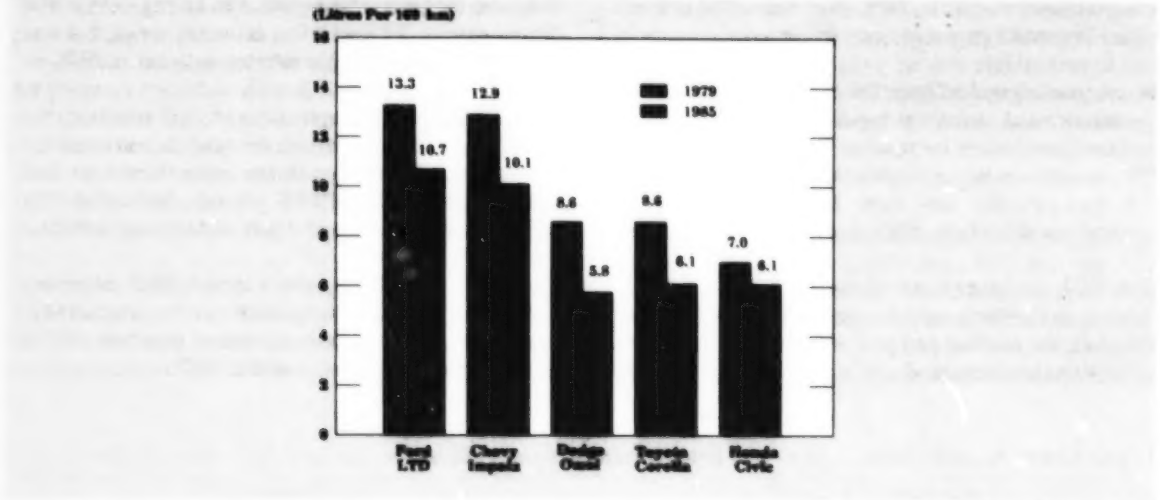
However, since 1982, the rate of fuel economy improvement for the average new car has levelled-off. This is one reason why the volume of gasoline used in Ontario has not declined from the 1982 levels.

REGISTERED PASSENGER CARS BY ENGINE SIZE



Source: Ontario Ministry of Transportation and Communications

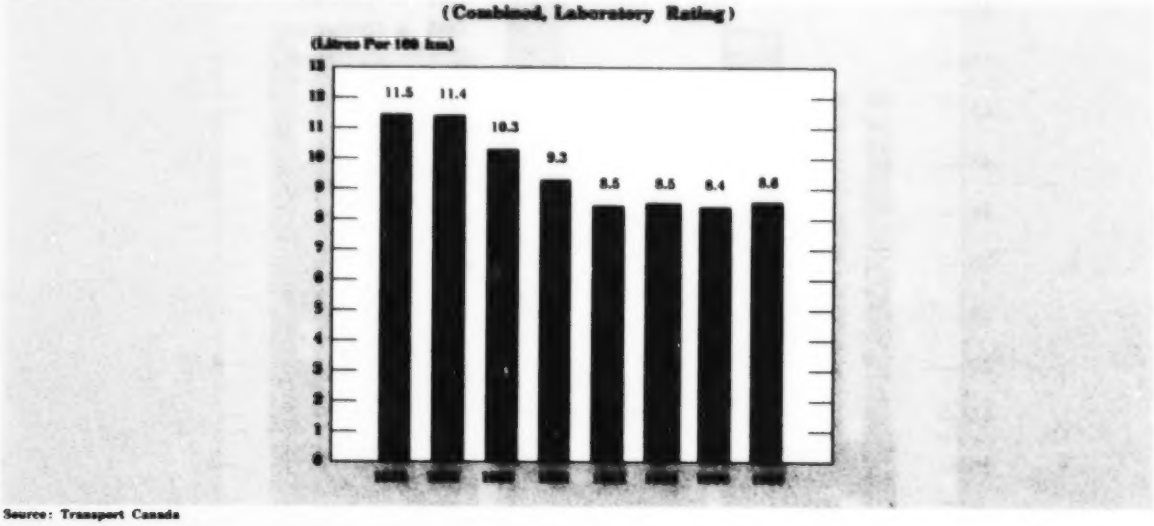
AUTOMOBILE FUEL EFFICIENCY



Source: Transport Canada

AVERAGE NEW CAR FUEL USE

(Combined, Laboratory Rating)



Source: Transport Canada

There are several reasons why the steady improvement in average new car fuel efficiency has not continued. First, allowing for the general level of inflation, gasoline prices decreased in 1983 and 1984. Second, the Ontario economy recovered dramatically from the 1982 recession. Increased income levels improved consumers' purchasing power, and made larger cars with energy-consuming options more affordable. Third, the supply of lighter, smaller, more efficient Japanese imported cars was restricted, limiting consumers' choice. Fourth, engineering limitations made it more difficult to achieve further efficiency gains without substantial investment by auto makers and added cost to the consumer. Most of the easily obtainable and least costly modifications had already been incorporated in previous model years.

But, even if there is no further improvement in average new car fuel economy in the coming years, the total number of cars on the road will become more efficient, as newer vehicles replace older ones.

Diesel and Other Fuels

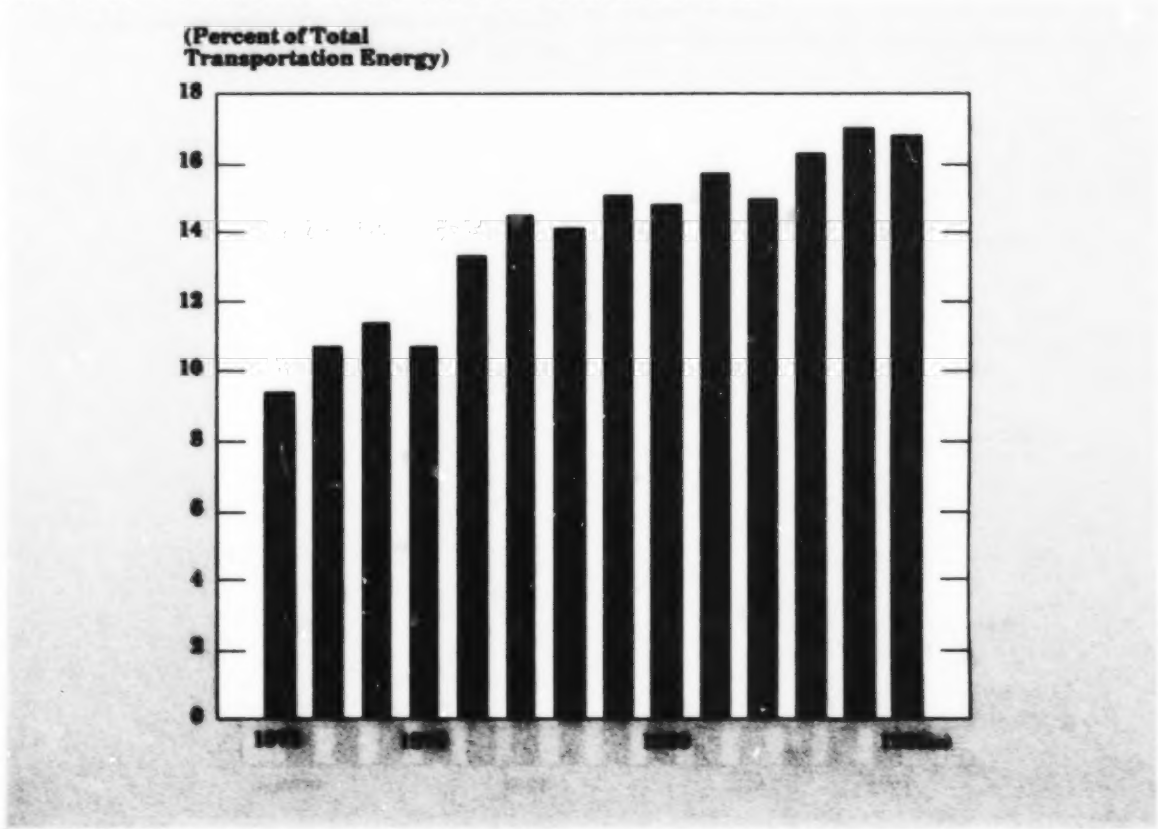
Diesel fuel use is heavily concentrated in the freight transportation sector. The majority of long distance trucks, all locomotives, and many Great Lakes freighters are powered by diesel engines.

Unlike gasoline, diesel fuel has increased its market share over the 1972 to 1985 period. During that period, the number of trucks registered in Ontario has more than doubled, from less than 500,000 to more than 1.1-million. Road transport of freight increased by about 25 per cent, while rail freight tonnage declined by about 14 per cent, and marine shipment remained steady.

This shift to road transport has been caused by a number of factors. Over the last 12 years, finished goods transport has increased its share of total freight, while raw materials shipments have declined in importance. Finished goods are more easily distributed by trucks because they need to be more widely dispersed, and do not usually require the specialized loading facilities of bulk goods. Another factor is the rationalization of railway facilities. Small freight volume centres, such as medium-size cities, can be serviced from a large, central rail terminal that is strategically located to handle several areas simultaneously. Also, increased use of containerized freight has expanded the volume of goods that can be hauled by road.

Although there has been vast improvement in the technical efficiency of truck engines since 1972, the adoption of these improvements by truck owners and operators has been uneven. The on-road efficiency of diesel freight trucks has not improved at the same level as gasoline-fuelled vehicles. Compared to rail and marine transport, trucks are less energy-efficient on a tonne-kilometre basis. On the other hand, trucks are much more convenient for many types of freight, and offer a greater diversity of services than the rail and marine transport.

DIESEL FUEL SHARE OF TOTAL TRANSPORTATION FUEL USE



Source: Statistics Canada

Another factor that has increased the diesel market share is the emergence of the small diesel engine. Since the mid-70s, the number of diesel-engined automobiles in Ontario has increased from almost zero to around 25,000 vehicles. Increasingly, the small truck and van market is choosing the diesel option for reasons of reliability and fuel economy.

Other transportation fuels include the aviation fuels, (turbo fuels and aviation gasoline), heavy fuel oil, electricity, and the alternative fuels such as propane and natural gas. In Ontario, the only alternative fuel that is now extensively used is propane. However, compressed natural gas is currently being introduced, and is expected to be a popular alternative to gasoline and propane for the short-range, fleet market.

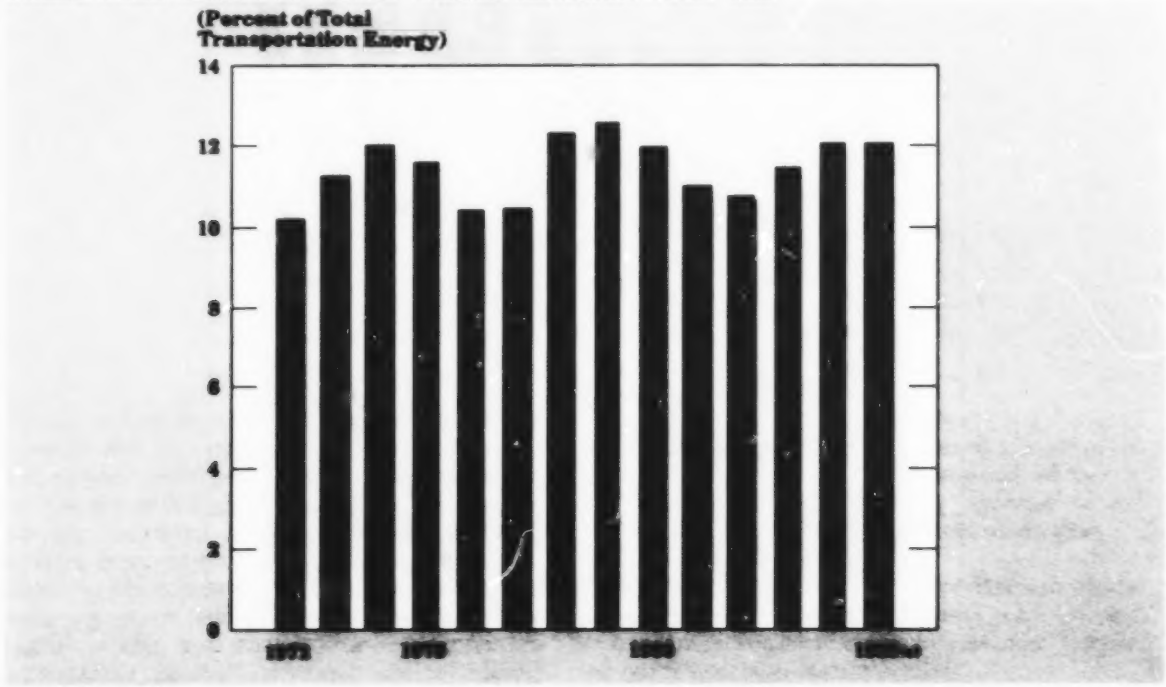
These fuels increased their market share slightly over the 1972-85 period. Aviation fuel use has been fairly steady, although the recession in 1982 did cause a significant decline in the demand for air travel. Airline passenger traffic is particularly sensitive to fluctuations in economic growth and disposable income. However, operating regulations prevent airlines from adjusting their flight schedules to completely offset fluctuations in passenger levels. Therefore, most airlines have a limited capacity to alter their energy consumption to match the demand for their services.

Propane has found an important niche in the market for transportation fuels. In 1980, there were virtually no propane-fuelled cars, trucks or vans in Ontario. By the end of 1985 there were approximately 60,000 propane-fuelled vehicles on Ontario's roads. High-mileage fleets, such as taxis and delivery vans, were the major users. However, individual private owners were also converting significant numbers of vehicles from gasoline to propane. In 1985, Ontarians used about 300-million litres of propane for transportation, compared to about 3 million litres in 1980.

Summary

Transportation fuel use became much more efficient in the last decade, largely due to the availability of more fuel-efficient automobiles. Diesel-powered vehicles became much more important as a growing economy shipped larger volumes of goods. And, in response to higher gasoline prices, a significant number of automobiles and trucks were converted to an alternative, gaseous fuel - propane.

OTHER FUEL SHARE OF TOTAL TRANSPORTATION FUEL USE



Source: Statistics Canada

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